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COLIFORM CONFIRMATION FROM RAW AND CHLORINATED WATERS WITH BRILLIANT GREEN BILE LACTOSE BROTH

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The use of various selective media for determining the presence of the coliform group in water has been studied by a large number of workers. In this brief communication no effort will be made to review this voluminous literature, which has been summarized by McCrady (*1*), who conducted an extensive study to compare the efficiency of various selective media with the Standard Methods Completed test. From this review and the results of his study he concluded: (1) that brilliant green bile lactose broth (B. G. B.) was the most satisfactory of the selective media tried; (2) that confirmation in B. G. B. usually yields more accurate results than those obtained by the Standard Methods Completed test; and (3) that fewer false positives were obtained with B. G. B. than with the other selective media. In addition, the time required for obtaining the coliform index was greatly shortened. Raw and treated inland waters were the source of McCrady's samples. Later Kelly (*2*) studied the use of the B. G. B. confirmatory procedure with samples of sea water and shellfish. His results are in agreement with those of McCrady, but the superiority of the B. G. B. confirmation was not so well marked in the case of shellfish. Since then Smith (*3*), and Howard, Lockhead, and McCrady (*4*) have reported a high degree of correlation in the use of B. G. B. as a confirmatory media.

Frequently the coliform index as determined by the use of B. G. B. was higher than that obtained by the Standard Methods procedure. The increased index thus obtained is on the side of safety, as far as water quality is concerned, and it also tends to compensate for the failure of the Standard Methods Completed test to demonstrate all coliforms present. This failure of the Standard Methods Completed test to detect all coliforms was clearly demonstrated by McCrady's results. He calculated that it failed to detect approximately 14 percent.

Practically all previous studies of this nature have based B. G. B. confirmation on gas production in B. G. B. after 48 hours' incubation at 37° C., with the amount of gas required for a positive result varying

from "10 percent or more" to "gas in any amount." The feeling exists on the part of some observers that by limiting the incubation period to 24 hours at 37° C. and accepting gas in any amount as the criterion for a positive, the results obtained would be comparable with those of the Completed test and 24 hours would be saved. Definite information on this point, particularly with chlorinated waters, appears to be lacking. The principal object of the present study was to obtain definite information concerning the point in question.

During the past year, in studies of polluted surface waters and waters treated by chlorination alone, coliform determinations were made on 945 samples; of these 228 were of raw water, and 717 were representative of the same water after treatment by chlorination to varying degrees. Gas-producing lactose broth tubes were confirmed by transfer to B. G. B. lactose broth and also by carrying through the Standard Methods Completed test. In making the Completed test the procedures given in Standard Methods were adhered to strictly. Gas-producing B. G. B. confirmatory tubes were also carried through the Completed test to determine whether the gas-producing B. G. B. tube contained a member of the coliform group.

With gas production in any amount after 48 hours' incubation as the criterion for a B. G. B. confirmed result, the "most probable numbers" (M. P. N.) of coliform organisms thus obtained from the 228 raw water samples were identical with those of the Completed tests in 79.8 percent of the samples, but higher in 15.4 percent and the Completed tests were higher in 4.8 percent. For this group of samples, if the B. G. B. results considered were limited to those showing gas in any amount during the first 24 hours of incubation only, the positive results would be reduced by 25 percent.

Consideration is now given to the results obtained from the examination of the 717 chlorinated samples. These samples were composed of 239 after primary chlorination, 239 after primary and secondary chlorination, and 239 samples of water from the distribution system which had been exposed to the effects of chlorine for varying lengths of time. The M. P. N.'s obtained by B. G. B. confirmation, using any amount of gas formation during 48 hours of incubation as the criterion for a positive result, were identical with those of the Completed test in 97.1, 95.4, and 96.7 percent, respectively, from the sources of samples as given. The B. G. B. results were higher in 2.5, 2.9, and 2.5 percent, and lower in 0.4, 1.7, and 0.8 percent, respectively. Considering the results from chlorinated samples from all sources as a unit and limiting positive B. G. B. confirmations to those obtained after 24 hours only, the positive results are reduced by 5.8 percent. These results are shown in table 1 and illustrated in figure 1.

TABLE 1.—*Coliform determinations from raw and chlorinated water by (a) Standard Methods Completed test, and (b) brilliant green bile confirmation*

Sample	Completed test higher	B. G. B. 48 hours higher	Results identical	B. G. B.	
				Higher at 48 hours	Same at 24 and 48 hours
(1)	(2)	(3)	(4)	(5)	(6)
	M. P. N. per 100 ml. from raw waters				
Number	11	35	182	52	176
Percent	4.8	15.4	79.8	22.8	77.2
	M. P. N. per 100 ml. from primary chlorinated waters				
Number	1	6	232	11	228
Percent	.4	2.5	97.1	4.6	95.4
	M. P. N. per 100 ml. from secondary chlorinated waters				
Number	4	7	228	11	228
Percent	1.7	2.9	95.4	4.6	95.4
	M. P. N. per 100 ml. from distribution system waters				
Number	2	6	231	15	224
Percent	.8	2.5	96.7	6.3	93.7

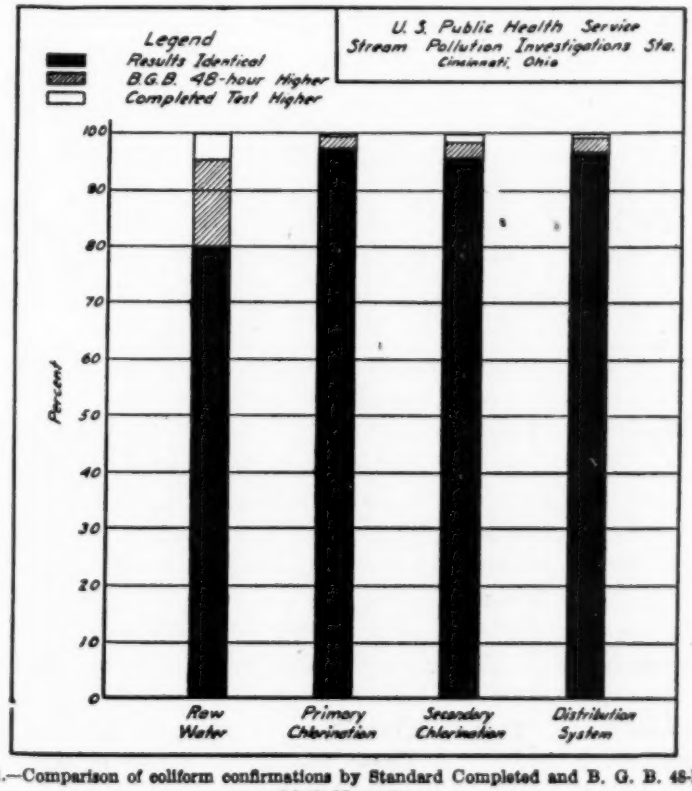

FIGURE 1.—Comparison of coliform confirmations by Standard Completed and B. G. B. 48-hour tests. M. P. N. results.

In studying the basic data from which the results of table 1 were obtained, it was noted that, particularly in the case of the results from chlorinated waters, the majority of the items reported under column 4, "Identical results" and column 6, "M. P. N.—Same at 24 and 48 hours," were made up from samples which had a zero (no positives from five 10-ml. portions) coliform index by both methods. Although this is the usual method of presenting such data, the inclusion of such a large number of negatives in the averages very greatly affects the percentages obtained and markedly obscures the real difference between the results of B. G. B. confirmation obtained after 24 and 48 hours of incubation, respectively.

Accordingly, to clarify this point the data of table 1 have been retabulated in table 2 with the B. G. B. confirmed results broken down into: (1) those with identical M. P. N.'s at both 24 and 48 hours of incubation composed of (a) those identical with a zero index and (b) those identical with a positive index; and (2) those with a higher index after 48 hours of incubation. This arrangement provides for a direct comparison between positive B. G. B. confirmations at 48 and at 24 hours of incubation.

It is noted from this table that, limiting the samples considered to those with positive results at either 24 or 48 hours, a very marked increase in positives, varying from 24.9 to 75 percent, is obtained by holding the B. G. B. confirmatory tubes for the additional 24-hour period. (It should be noted here that all of these 48-hour B. G. B. gas-forming cultures, except one, were subjected to the Standard Methods Completed test as will be described presently.)

Although it may be merely a coincidence, it is interesting to note that the percentage of B. G. B. positives, obtained between the

TABLE 2.—*Coliform confirmations in B. G. B. after 24 hours and 48 hours of incubation at 37° C.*

Sampling source	Samples	Samples giving M. P. N.				Total number of samples
		Same at 24 and 48 hours			Higher at 48 hours	
		Including all samples	Negative samples	Positive samples		
Raw water	Number	176	19	157	52	228
	Percent	77.2	8.3	68.9	22.8	
				[1] 75.1	[1] 24.9	
Primary	Number	228	215	13	11	239
	Percent	95.4	90.0	5.4	4.6	
				[1] 54.2	[1] 45.8	
Secondary chlorination	Number	228	222	6	11	239
	Percent	95.4	92.9	2.5	4.6	
				[1] 35.3	[1] 64.7	
Distribution system	Number	224	219	5	15	239
	Percent	93.7	91.6	2.1	6.3	
				[1] 25.0	[1] 75.0	

[1] Percent calculated on basis of positive samples only.

twenty-fourth and forty-eighth hour of incubation, increases with the chlorine dosage and with the time of exposure to chlorine. Thus, in table 2, for raw lake water the percentage was 24.9, for primary chlorinated waters 45.8, for water subjected to both primary and secondary chlorination 64.7, and for waters from the distribution system 75.0. These results are presented graphically in figure 2.

A similar comparison has been made of B. G. B., confirmed results with completed results on the basis of each lactose broth tube showing

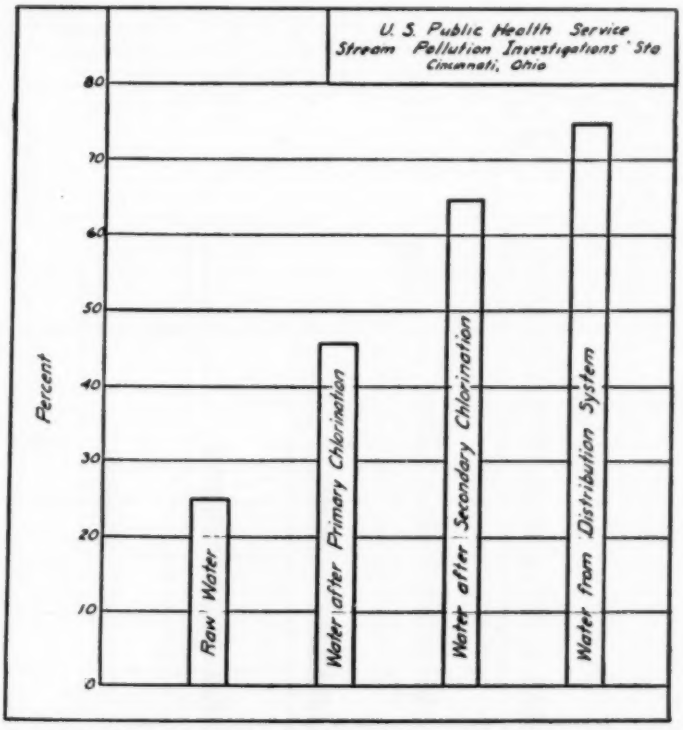

FIGURE 2.—Percent of positive samples showing higher M. P. N. after 48-hour incubation. (B. G. B. confirmation.)

gas production. From the raw-water series, 726 gas-producing lactose broth tubes were tested by both procedures. Of these tubes, 675 were completed by Standard Methods and 51 failed. From this group, in the B. G. B. medium, 89.0 percent confirmed in 24 hours, 98.6 percent confirmed by producing gas during the 48-hour period and 1.4 percent produced no gas. All of the 51 tubes which failed to complete by Standard Methods confirmed in B. G. B., 32 after 24 hours and 19 only after 48 hours. Of these 51 B. G. B. tubes, 39 were carried through the completed test; 15 of these completed and 24 failed to complete. From the raw water samples there were 144 tubes which produced gas in the primary lactose broth tube but failed to confirm either by the Standard Methods Completed test or with B. G. B.

From the 239 primary chlorinated samples 29 gas-producing lactose broth tubes were tested by both procedures. Of these 20 were positive by the Completed test and 9 failed. These 9 tubes which produced gas, a bubble or more, in B. G. B. were carried through the Completed test; 2 confirmed and 7 failed to confirm. Similarly, 20 gas-producing tubes were obtained from 239 secondary chlorinated water samples. Of these 11 completed and 9 failed. All of these 9 cultures produced gas in B. G. B. in 48 hours and were subjected to the Completed test;

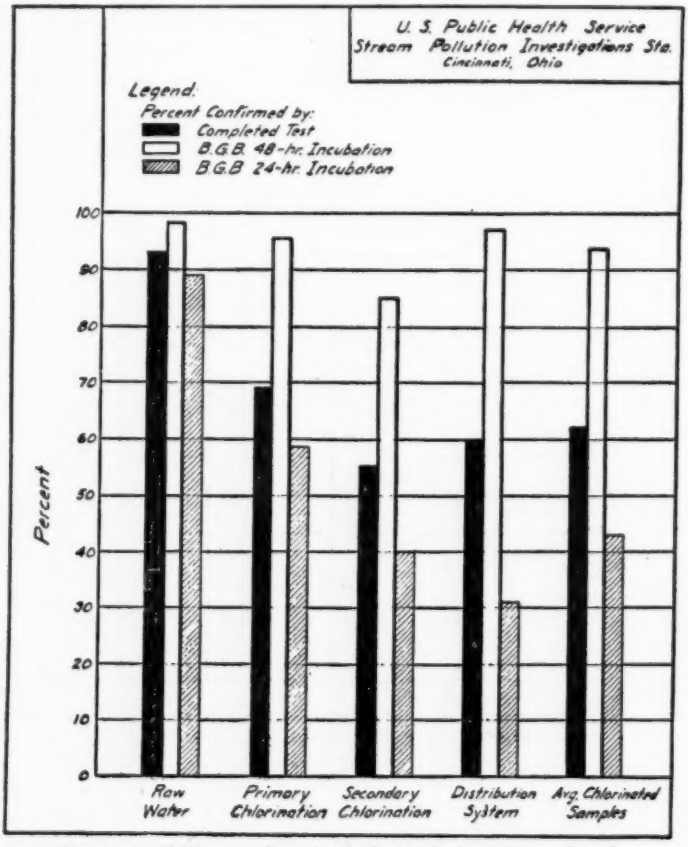

FIGURE 3.—Coliform confirmations. Gas-producing tubes confirmed.

3 completed and 6 failed. From the distribution system samples, 35 gas-producing tubes were obtained. Of these, 21 completed by Standard Methods and 14 failed. All of these 14 cultures produced gas in B. G. B. and all but one of the 14 B. G. B. tubes were carried through the Completed test; 3 completed and 10 failed.

From all of the chlorinated and finished water samples, there was a total of 243 primary lactose broth tubes which failed to confirm by either method. Frequently gas production in these tubes was due to a mixed culture, or the presence of spore bearers.

Considering all of the treated water samples as a unit, 52 out of the 84 gas-producing tubes completed by the Standard Method, 79 confirmed by producing gas in B. G. B. during 48 hours, and 36 confirmed by producing gas in B. G. B. in 24 hours. Complete data for all samples considered in this manner on a tube basis are presented in table 3 and figure 3.

TABLE 3.—*Coliform confirmations* [1] *obtained by (1) Standard Methods Completed test and (2) B. G. B. after 24 and 48 hours' incubation*

Sampling source	Number of gas-producing tubes	Number tubes positive by—			Percent of tubes positive by—		
		Completed test	B. G. B. 48 hours	B. G. B. 24 hours	Completed test	B. G. B. 48 hours	B. G. B. 24 hours
Raw water	726	675	716	646	93.0	98.6	89.0
Primary chlorination	29	20	28	17	69.0	96.6	58.6
Secondary chlorination	20	11	17	8	55.0	85.0	40.0
Distribution system	35	21	34	11	60.0	97.1	31.4
Total chlorinated	84	52	79	36	61.9	94.0	42.8

[1] Calculations based on number of tubes producing gas (in any amount) in the primary lactose broth tube during 48 hours' incubation at 37° C.

SUMMARY

A comparison of coliform determinations in raw and chlorinated water by (1) B. G. B. confirmation and (2) Standard Methods Completed test has been made. In general, the results obtained with B. G. B. are slightly higher than those of the Completed test when any amount of gas in B. G. B. after 48 hours' incubation at 37° C. is accepted as the criterion of a positive result.

The relative number of positive B. G. B. confirmations obtained after 24 and 48 hours of incubation appears to vary with the nature of the water; the more extensively the water has been treated or the longer it has been exposed to the effects of chlorine, the greater the number of B. G. B. confirmations obtained between the twenty-fourth and forty-eighth hour of incubation.

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PARENTAL AND FAMILIAL FACTORS IN THE ACCEPTANCE OF DIPHTHERIA AND SMALLPOX IMMUNIZATION [1]

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Students of health education have commonly suggested that specific services offered by public health agencies have an educational effect and that, therefore, the ultimate value of these services should be measured not solely in the direct health protection so conferred but also in terms of what is learned by the recipient of these services. Thus it has been maintained that the child who is immunized against diphtheria learns the value of this prophylaxis and will, therefore, in later life as a parent be more ready to provide a similar protection for his children. Unfortunately no factual evidence is available to support or deny this contention. The study here reported is an exploratory attempt to determine whether or not the individual who has been immunized against diphtheria or smallpox is more likely to provide for the immunization of his children than is one who was not so protected and whether or not the parent who has learned to provide for one child will similarly safeguard other members of the family.

Nurses on the staff of the St. Paul Family Nursing Service obtained histories from the mothers who were bringing children to attend the agency's Child Health Supervision Clinics. A uniform blank was used throughout the study, this blank including, among other items, questions regarding the immunization status of father, mother, and all the children in the family, nature of reaction experienced by the mother at the time of immunization, and the reason for failure to provide immunization for those children who had not been protected. Obviously the information as to parental immunization, and especially of attendant reaction, is often inaccurate but the mental attitude of the parent toward immunization is conditioned by what the person recalls, whether memory is correct or incorrect. Thus the replies on these points, though often unreliable, do reflect what these persons believed to be correct and represent a true picture of whether or not the person has or has not learned the value of such prophylaxis from what he believes to have been his experience with it.

The group for study was selected from the city of St. Paul as this city has for a number of years been conducting its diphtheria immunization and smallpox vaccination through a combination of clinics in the schools for the school children and regular periods in the

[1] From the Department of Preventive Medicine and Public Health, University of Minnesota, and the St. Paul Family Nursing Service.

Board of Health Office, supplemented during the past 4 years by annual clinics, in cooperation with Family Nursing Service, at their district stations. As no immunization was given in the regular clinics of the Family Nursing Service, all protection of the children here studied required attendance at one of the other clinics or the services of the family physician. As the group served was in general financially unable to afford the latter, any immunization of a preschool child would represent an effort on the part of the mother, who would have had to make special trips to take her child to the Board of Health clinics. It would therefore represent an active desire on the part of the parent (usually the mother) to obtain this protection for her child, not merely placid acceptance of a procedure which was virtually thrust upon her, as in some clinics.

The present study included 1,534 families with 3,684 children. Inasmuch as vaccinations and immunizations were not recommended for children under 6 months of age, most of the tabulations concern only the children above that age, of whom there were 3,372.

Vaccination and immunization [2] *status of the group as a whole.*—Of all the children over 6 months of age 66.1 percent had been vaccinated and 63.9 percent immunized against diphtheria (table 1). These rather high rates are, of course, reflections of the nature of the special group being studied.

TABLE 1.—*Vaccination and immunization status of children surveyed*

	Number	Percent		Number	Percent
Vaccinated	2,219	66.1	Immunized	2,137	63.9
Not vaccinated	1,140	33.9	Not immunized	1,206	36.1
Total	[1] 3,359	100.0	Total	3,343	100.0

[1] The figures in this and subsequent tables often do not equal the total of 3,372 children in the study, due to occasional defective records, omission of an item from the completed history, or uncertainty on the part of the parent as to the exact status of certain children.

In general, both vaccination and immunization had been performed if either had been done. Of the children who had been vaccinated 92.3 percent were also immunized and an even higher proportion, 95.3 percent, of those immunized had been vaccinated (table 2). The policy of the Health Department of giving the first inoculation against diphtheria at the same time as the vaccination may have been a factor in this high rate of protection against both diseases if immunization had been given against either. The figures suggest, however, that acceptance of the principle of immunization has carried with it a desire to avail oneself of whatever protection was offered.

Age.—The vaccination and immunization status for the entire group of children according to age level as of the time of the study

[2] For the sake of brevity, the term "vaccination" is used throughout the remainder of this article to imply vaccination against smallpox and the term "immunization" to imply immunization against diphtheria unless the context clearly implies otherwise.

is shown in table 3. The tendency for a slightly higher proportion to be vaccinated than to be immunized holds fairly consistently at all ages, except 6 years. Here the factor reversing the ratio may be the influence of the school clinics.

Table 4 indicates the ages at which vaccinations and immunizations were performed for all children who had been protected. It will be noted that practically one-half had been done before the end of the third year of life. Approximately one-fifth of the vaccinations and

TABLE 2.—*Relation between vaccination and immunization status of children surveyed*

	Number	Percent	Number	Percent
	Vaccinated		Not vaccinated	
Immunized	2,031	92.3	101	8.9
Not immunized	170	7.7	1,036	91.1
Total	2,201	100.0	1,137	100.0
	Immunized		Not immunized	
Vaccinated	2,031	95.3	170	14.1
Not vaccinated	101	4.7	1,036	85.9
Total	2,132	100.0	1,206	100.0

TABLE 3.—*Vaccination and immunization status by age of children at time of survey*

Age of child (years)	Number of children in each group	Percent vaccinated and immunized	Percent vaccinated but not immunized	Percent immunized but not vaccinated	Percent not immunized or vaccinated	Total percent
½ to 1	262	14.9	0.4	1.1	83.6	100.0
1	575	37.4	1.9	1.7	59.0	100.0
2	386	47.2	4.9	2.1	45.9	100.1
3	345	55.9	8.1	3.5	32.5	100.0
4	276	62.0	8.3	4.3	25.4	100.0
5	222	60.8	13.5	5.4	20.3	100.0
6	187	77.5	5.3	10.2	7.0	100.0
7	125	87.2	4.8	3.2	4.8	100.0
8	135	88.1	2.2	3.7	5.9	99.9
9	105	94.3	2.9	1.9	1.0	100.1
10 and over	624	90.4	5.0	2.1	2.4	99.9
Total	3,242					

TABLE 4.—*Age at which vaccinations and immunizations were performed*

Age (years)	Vaccinated		Immunized	
	Number	Percent	Number	Percent
Under 2	1,012	47.3	933	45.7
3–4	315	14.7	289	14.1
5–6	448	21.0	502	24.6
7–8	139	6.5	137	6.7
9 and over	225	10.5	182	8.9
Unknown	(80)		(94)	
Total (less unknown)	2,139	100.0	2,043	100.0

one-fourth of the immunizations were performed at about the age of entrance to school—5 and 6 years.

It is of interest to compare the extent of vaccinations and immunizations in early life among the entire group of children with that among the youngest children, as an indication of progress toward protection of the infant and young child. Examination of table 4 reveals that 47.3 percent of the vaccinations of all the children who had been protected against smallpox were performed before the age of 3 years; on the other hand 52.1 percent (table 3) of all those who were 2 years old at the time of the present study had already been vaccinated. A similar phenomenon holds for diphtheria immunizations. In comparing these proportions, 47.3 percent and 52.1 percent, one should keep in mind the fact that the former figure is based only upon those who eventually were vaccinated (i.e., 66.1 percent of the total), whereas the 52.1 percent applies to all the 2-year-olds of the study.

The experience of this group of families indicates that for children of all ages, including those who attended the clinic and those who did not (though a younger sibling was registered at the clinic), less than one-third (47.3 percent×66.1 percent) had had either vaccination or immunization before the end of the third year of life; whereas of children now 2 years old (practically all of whom attended the clinic) over one-half have already had both protections. This increase possibly reflects the greater emphasis in recent years on protection of the infant and very young child, particularly the direct influence of the clinic and the recent provision of special facilities for this by the Health Department.

Sex.—A slightly higher proportion of females than of males was vaccinated and immunized (table 5). In the case of vaccination the difference was only of such a magnitude as might have arisen 17 times out of 100 solely due to errors of random sampling; in the case of immunization the difference is more probably significant. It is of interest that a similar higher frequency among females, for ages below 25 years, was noted in Collins' (*1*, *2*) analysis of the United States Public Health Service survey.

TABLE 5.—*Relation between sex of child and vaccination and immunization status*

Sex	Number	Percent	Number	Percent	Total number
	Vaccinated		Not vaccinated		
Males	1,102	65.3	586	34.7	1,688
Females	1,114	67.6	534	32.4	1,648
(pz^2=0.167)					
	Immunized		Not immunized		
Males	1,048	62.3	633	37.7	1,681
Females	1,085	66.2	554	33.8	1,639
(pz^2=0.021)					

Socio-economic status.—The present study included only a relatively homogeneous socio-economic group, determined by eligibility for the clinics. An attempt to break it down on the basis of a crowding index (ratio of number of persons in a household to the number of rooms) revealed no significant variation according to the index used. In the survey of 9,000 families reported by Collins (*1*, *2*), it was found that families with incomes of less than $1,200 or more than $5,000 per year had about the same vaccination rates but both were nearly twice the rates for the three intervening classes. No meaningful comparison between Collins' study and the present one is possible because of the limited income range of this group.

Effect of parental vaccination and immunization status.—Children whose mothers had been vaccinated were vaccinated to a slightly (though significantly) greater extent than were children whose mothers had not been vaccinated, the proportions being 67.2 percent and 59.5 percent, respectively (table 6). Similar rates prevail according to vaccination status of the father. On the other hand, the diphtheria immunization status of neither the father nor the mother had any apparent relation to the likelihood that the children would be immunized.

In interpreting the differences, which are statistically significant in the case of vaccinations, it should be recalled that many of these parental vaccinations were performed during the epidemic of malignant smallpox in Minnesota in 1924 to 1925. The differences may

TABLE 6.—*Relation between vaccination and immunization status of parents and that of their children*

Status of parent	Status of children over 6 months of age				
	Number	Percent	Number	Percent	Total number
	Vaccinated		Not vaccinated		
Mother:					
Vaccinated	1,894	67.2	923	32.8	2,817
Not vaccinated	311	59.5	212	40.5	523
(pz^2=0.001)					
	Immunized		Not immunized		
Immunized	665	63.8	378	36.2	1,043
Not immunized	1,366	64.2	761	35.8	2,127
(pz^2=0.813)					
	Vaccinated		Not vaccinated		
Father:					
Vaccinated	1,549	68.1	726	31.9	2,275
Not vaccinated	223	61.4	140	38.6	363
(pz^2=0.012)					
	Immunized		Not immunized		
Immunized	500	66.1	257	33.9	757
Not immunized	582	65.1	312	34.9	894
(pz^2=0.678)					

reflect the subsequent influence of fear of smallpox occasioned by this epidemic rather than any true educational effect of the vaccinations themselves.

In the case of diphtheria, there has been no such additional motivating force and there is no difference in the extent of immunization of children of immunized as contrasted with nonimmunized parents. Even the difference in the case of smallpox vaccination, though significant, is disappointingly small. Perhaps the most significant fact is that approximately a third of the children of the immunized or vaccinated parents had not as yet been protected.

It seems apparent from these data that, so far as concerned the group under study, the immunization or vaccination of the parental generation earlier in life does not appreciably increase the subsequent readiness of these parents to accept or seek similar procedures for their children. The fact that, except for a slight difference in the case of smallpox vaccination, the unprotected parents provided for the vaccination and immunization of their children as well as did those who had been protected themselves, would suggest that the latter group had not undergone an educational as well as an antigenic experience at the time of its immunizing experience in childhood.

Effect of severity of mothers' reactions.—The mothers were asked to classify the reactions which they had experienced at the time of vaccination and immunization as none, mild, moderate, or severe. The severity of these reactions (table 7) had no measurable effect on whether or not the children were later protected. The rates for diphtheria immunizations showed a slight trend toward fewer inoculations among those children whose mothers had experienced what they considered to have been severe reactions, but this trend was not statistically significant.

TABLE 7.—*Relation between mother's reaction to vaccination and immunization and children's vaccination and immunization status*

	Status of children over 6 months of age				
	Number	Percent	Number	Percent	Total number
	Vaccinated		Not vaccinated		
Mother's reaction to vaccination:					
None or mild	799	65.5	420	34.5	1,219
Moderate	495	68.1	232	31.9	727
Severe	457	68.5	210	31.5	667
($p\chi^2 = 0.327$)					
	Immunized		Not immunized		
Mother's reaction to immunization:					
None or mild	355	64.2	198	35.8	553
Moderate	124	61.7	77	38.3	201
Severe	37	59.7	25	40.3	62
($p\chi^2 = 0.607$)					

Effect of vaccination and immunization of older siblings.—Does vaccinating and immunizing an older sibling increase the probability that younger siblings will receive protection? It will be seen from table 8 that in two-child families where the younger sibling was over 6 months of age, if the older child was vaccinated, 54 percent of the younger siblings were also vaccinated; whereas if the older child was not vaccinated only 1.2 percent of the younger siblings were protected. Almost exactly parallel rates were found for diphtheria immunizations (as might be expected from the practice of giving the first diphtheria inoculation and the smallpox vaccination at the same time). Thus it appears that in the clinic group if the older child is protected there is a much greater probability that the younger child will be similarly vaccinated and immunized, than if the older child is not protected.

Palmer and Derryberry (*3*) studied the data collected in 156 cities during the White House Conference Survey. They found for ages up to 3 years in two-child families a higher proportion of younger siblings immunized if their older siblings had been vaccinated than younger siblings vaccinated if the older siblings were immunized. From this, as well as from other considerations, they conclude that health agencies are stressing diphtheria immunization more than smallpox vaccination for very young children.

This conclusion does not apply to the St. Paul group of the present study. Table 8 reveals that if the older sibling was vaccinated,

TABLE 8.—*Relation between vaccination and immunization of older child to that of younger child in two-child families (all younger children over 6 months of age)*

Status of older child	Status of younger child				
	Number	Percent	Number	Percent	Total number
	Vaccinated		Not vaccinated		
Vaccinated	141	54.0	120	46.0	261
Not vaccinated	1	1.2	83	98.8	84
	Immunized		Not immunized		
Vaccinated	137	52.9	122	47.1	259
Not vaccinated	3	3.6	81	96.4	84
	Immunized		Not immunized		
Immunized	139	55.2	113	44.8	252
Not immunized	1	1.1	90	98.9	91
	Vaccinated		Not vaccinated		
Immunized	138	54.5	115	45.5	253
Not immunized	3	3.3	88	96.7	91

52.9 percent of the younger siblings were immunized; whereas if the older sibling was immunized, 54.5 percent of the younger siblings were vaccinated. The numbers of children involved were too small for significant analyses for each separate year of age so as to make the data comparable to that of Palmer and Derryberry. But all of the younger children in the present study must have been of preschool age in order to be registered at the clinics. Also table 3 indicates that a slightly higher proportion, at each age from 1 to 5 years, was vaccinated than was immunized.

Effect of mothers' schooling.—One might logically expect that the farther a parent had progressed in school the greater would be the probability that the children would be vaccinated and immunized. It is somewhat surprising therefore to find that (table 9), of the children whose mothers had attended only grade school, 71 percent had been vaccinated whereas only 61.7 percent of those whose mothers had attended high school had been vaccinated. If the mothers had attended college the rates rose again to 66.3 percent. Similar rates were found for immunization. The chance that such differences might arise solely due to errors of random sampling is less than 1 per 1,000.

One possible explanation for fewer vaccinations and immunizations among children whose mothers had attended high school is the fact that such mothers tended to have smaller families (1.9 children) than did mothers who had attended only grade school (2.7 children). It might be surmised that since the grade school mothers had relatively more children, some of these would be older and thus obtain a greater probability of being vaccinated and immunized on entrance to school. Analysis of preschool children by individual years of ages did not, however, substantiate this hypothesis. The same trend, higher frequency of vaccinations and immunizations among children of grade school mothers than among children of high school mothers, appeared in the 2-, 3- and 4-year-old children. For lack of a more satisfactory expla-

TABLE 9.—*Relation between mother's schooling and vaccination and immunization status of children*

Extent of mother's education	Number of children per family	Status of children over 6 months of age									
		Vaccinated		Not vaccinated		Total number	Immunized		Not immunized		Total number
		Number	Percent	Number	Percent		Number	Percent	Number	Percent	
Grade school	2.7	1,022	71.0	418	29.0	1,440	1,002	69.9	432	30.1	1,434
High school	1.9	944	61.7	587	38.3	1,531	892	58.6	630	41.4	1,522
College	1.9	118	66.3	60	33.7	178	120	67.8	57	32.2	177
			($p\chi^2$=<0.001)					($p\chi^2$=0.001)			

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nation, one is tempted to wonder as to the applicability of the old adage that "A little knowledge is a dangerous thing." May high school education actually increase one's resistance to vaccination and immunization?

Reasons for failure to vaccinate and immunize.—If the mother had any children who had not been vaccinated and immunized, she was asked to state the reason for the failure. A rough classification of these reasons is presented in table 10. Shepard (*4*) previously studied the immunization status of 6,245 urban children in the western part of the United States. The reasons which he found for failure to immunize are also tabulated in table 10 for comparison.

TABLE 10.—*Reasons given by mothers for failure to have children over 6 months of age vaccinated and immunized*

Reasons	Present study				Shepard's study (*4*)		
	Mothers whose children were not vaccinated		Mothers whose children were not immunized		Number	Percent	Reasons
	Number	Percent	Number	Percent			
Procrastination	327	41.4	327	40.6			
Neglect	177	22.4	186	23.1	979	50.0	Lethargy.
Inconvenience	18	2.3	18	2.2			
Ignorance of procedure	3	.4	4	.5			
Child too young	76	9.6	75	9.3	406	20.7	Ignorance.
Prejudice	49	6.2	52	6.5	424	21.7	Opposition.
Ignorance of free facilities	12	1.5	12	1.5	131	6.7	Economic.
"Medical"	57	7.2	59	7.3	18	.9	Legitimate medical.
Not classified	71	9.0	73	9.1			
Total	790	100.0	806	100.1	1,958	100.0	

It will be noted that two-thirds of the reasons in the present study could be classified under the general heading of lethargy, namely, procrastination ("I always intended to do it," "I intend to do it next month," etc.), neglect ("I just neglected it," "Never thought much about it," etc.), and inconvenience ("Too hard to get to center," etc.); 50 percent of the failures in Shepard's study could be attributed to lethargy.

Only a negligible number of mothers of unprotected children stated that they were ignorant of the procedures and those few were new arrivals at the clinics. Practically 10 percent stated that their children were too young, even though no children under 6 months of age were considered; some intimated that they were waiting until the child was of school age. Shepard in 1933 found a higher proportion, 20.7 percent, due to ignorance, including "child too young." This may be, at least partly, a reflection of the fact that he made a survey of the general population whereas all the present group of mothers were

under clinic influence. His findings of three times as much definite opposition may also be attributed to the differences in the nature of the groups studied, as well as the differences in sections of the country and time.

Over 7 percent of the reasons fall into the "medical" category. Concerning this fact it should be mentioned that mothers' explanations were classified there even on vague health grounds, for example, "Child has been ill a lot".

In view of the lack of any evidence to suggest that immunization of the parent conduced to acceptance of such procedures for the offspring, it is of interest to determine whether there was any significant difference in the reasons given by these parents to excuse their failure to protect their children and those excuses given by nonimmunized parents. Such data are presented in table 11. Only one substantial

TABLE 11.—*Reasons given for failure to vaccinate and immunize according to whether or not the mother had been protected*

Reasons	Failure to vaccinate		Failure to immunize	
	Mothers vaccinated	Mothers not vaccinated	Mothers immunized	Mothers not immunized
	Percent	*Percent*	*Percent*	*Percent*
Procrastination	41.4	39.8	44.8	37.4
Neglect	22.6	24.1	19.1	26.2
Inconvenience	2.3	2.3	.7	3.3
Ignorance of procedure	.2	.8	.7	.2
Thought child too young	10.2	6.8	9.7	8.7
Prejudice	5.0	12.0	7.3	6.0
Ignorance of free facilities	1.5	1.5	.7	1.9
"Medical reasons"	7.6	5.3	8.0	7.2
Not classified	9.4	7.5	9.0	9.1
Total	100.2	100.1	100.0	100.0
Number studied [1]	660	133	288	484

[1] Totals here apply to number of mothers who had one or more children over 6 months of age not vaccinated or not immunized.

variation is noted, and even that is not as large as one might expect; 12 percent of the mothers who had not themselves been vaccinated gave prejudice against the procedure as a reason whereas only 5 percent of the mothers who had been vaccinated gave it as a reason. In the case of immunization there seemed to be no difference between the two groups with regard to prejudice against the procedure.

DISCUSSION

The data here reported are based on a narrow and not too typical section of the general population, but one in which the average health program finds its greatest need and upon which it concentrates its greatest emphasis. The findings, though requiring confirmation in other groups and possibly not typical of any group other than that here studied, have, however, certain implications as to the educa-

tional value of immunization against diphtheria and smallpox. They fail to show that the person who has been immunized has, through this mere fact, learned the value of the procedure to any greater degree than has the person who did not submit to immunization. It should be emphasized that in the majority of instances the immunizations that the parents had received must have been obtained in large school clinics where in all probability more emphasis had been given to the process of getting the child immunized (consent slip, arrangement of clinics, etc.) than to explaining to the child the reasons for such immunization. No deductions are possible as to the educational effect that would have attended an immunization program of any other type.

The data as to the relationship between the immunization, or lack of immunization, of the younger child to that of the older child in a two-child family would strongly suggest that the direct education of the mother at the time of the first child is an important factor in determining the protection of subsequent children. The findings here reported suggest that unless the mother is taught to protect her firstborn, she is not likely to protect the younger. This is obviously of greater significance than is the prior immunization experience of the parents themselves and indicates that special emphasis should be directed to this group of mothers.

The failure to show any correlation between the extent of education of the parents and the likelihood of immunization of the children is disappointing though perhaps not unexpected. It would imply that health education as carried on in the high schools had not had a significant effect in shaping the child's subsequent attitude in his parental responsibility for so simple a thing as diphtheria or smallpox protection. One may only speculate as to its effect on other health protection which is less simply measured.

One obvious limitation of the present investigation is the fact that it was based only upon a clinic-attending group. This group was chosen because of ease of collecting data and because it gave a certain control over the amount of specific, immediate pressure for vaccination and immunization. To be more meaningful, however, similar studies ought to be undertaken of other population groups, or even of the general population. One interesting group would be recent graduates of universities or colleges which have been offering vaccination and immunization as part of student health services. Here the procedures would have been performed at an age when they might be expected to exert maximum educational benefit, and definite records of the procedures would be available, thus eliminating the memory factor of the present study.

Most evaluations of health education are based upon knowledge or aptitude tests. The technique used here involves measurement of

actual health behavior, namely, number of children for whom immunization and vaccination had been provided. The question was not "Would you do this?" but "Have you done this?" The latter is obviously a more meaningful test of the results of an educational procedure and would appear to be worthy of more extensive trial.

SUMMARY

This was a study of the relations of certain educational and social influences on the vaccination and immunization status of 3,684 St. Paul children in 1,534 families; at least one child in each family was registered at a Child Health Supervision Clinic.

1. Of the children over 6 months of age, 66.1 percent were vaccinated and 63.9 percent immunized. This tendency for a slightly larger proportion to be vaccinated than to be immunized held quite generally for separate age groups, except for children 6 years of age. Practically one-half the vaccinations and immunizations had been performed before the age of 3 years.

2. There was a slightly higher frequency of protection against both smallpox and diphtheria among females than among males, but the statistical significance of the difference is questionable.

3. If either the mother or father had been vaccinated there was a slightly greater probability that the child would be vaccinated than if the parents had not been protected. However, the fact that either parent was inoculated against diphtheria did not increase the chances that the children would be immunized.

4. There was no measurable relation between the severity of a mother's reaction to vaccination or immunization and whether or not the child was protected.

5. In two-child families where the younger child was over 6 months of age, if the older sibling was vaccinated, 54 percent of the younger siblings were protected. Almost exactly parallel rates were found for diphtheria immunization. If the older sibling was not immunized, only 1.2 percent of the younger siblings were protected.

6. Children whose mothers attended only grade school were vaccinated and immunized to a greater extent than were children whose mothers attended high school. The difference could not be wholly attributed to the fact that grade school mothers had larger families and older children.

7. A rough classification of the reasons given by mothers for failure to have their children immunized and vaccinated revealed that procrastination and neglect accounted for over 60 percent of the failures.

8. No substantial differences were noted in the reasons given for failure to have children protected, according to whether or not the mothers had been vaccinated or immunized.

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EXPERIMENTS IN THE COOKING OF GARBAGE FOR THE DESTRUCTION OF TRICHINAE IN PORK SCRAPS[1]

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During the past several years many inquiries have been received from public health officials concerning methods of cooking garbage before its consumption by swine as a means of controlling human trichinosis. The present experiments were carried out with the view of providing information which could be employed in the framing of regulations for the heating of garbage for the destruction of trichina larvae.

Ransom and Schwartz (*1*) reviewed the literature on the effects of heat on the infective larvae of *Trichinella spiralis* and conducted a series of experiments in which it was found that the vitality of these larvae was quickly destroyed by exposure to a temperature of 55° C. gradually attained, and further that exposure to temperatures in the neighborhood of 50° C. for a sufficient period of time rendered the larvae nonviable. More recently Otto and Abrams (*2*) confirmed these results.

The findings of Ransom and Schwartz formed the basis of Federal meat inspection regulations governing the processing of certain pork products for the destruction of trichinae. However, the data do not provide an answer to the question of how long garbage should be cooked in order to destroy trichinae in pieces of pork of various sizes contained in the material.

EXPERIMENTAL PROCEDURE

In a recent paper one of the authors (*3*) discussed the various methods which have been employed for the heat treatment of garbage and concluded that the cooking of garbage in an open container is the most practical and least expensive of these various processes. In fact, this would appear to be the method employed by most of the hog feeders who are cooking garbage at the present time. In view of these facts, the present experiments were carried out by introducing

[1] From the Division of Zoology, National Institute of Health.

infected pork into garbage cooked by means of steam in an open container.

Through the courtesy of Dr. J. LeRoy Wright, former warden, and Harold E. Donnell, acting warden of the Maryland House of Correction, Jessups, Md., permission was granted to use the cooking equipment of that institution for these experiments. This equipment consists of a steam boiler and two steel cooking tanks, along the bottom of each of which is placed a single steam pipe provided with numerous apertures through which the steam escapes into the garbage. The container used for these experiments was a cylindrical tank 10 feet in length and 3 feet in diameter, and having a capacity of 525 gallons. The top portion of the tank was cut away and covered customarily with a single piece of corrugated iron roofing. During these experiments no cover was used. The boiler carries 70 pounds of steam at full head but the cooking was done with 60 pounds of steam. The garbage employed in these tests had been collected from Camp Meade, Md., early in the morning of the day of each experiment and was placed in the cooking tank on arrival of the truck at the institution. In each experiment approximately 300 gallons of garbage were placed in the tank and water added to bring the contents to a semifluid consistency.

The trichinous pork was obtained from a cross-bred Poland China hog which was received on April 27 and infected with trichinae on April 28 and June 9. On receipt the animal weighed 103 pounds and at the time of butchering on July 29 weighed 180 pounds. The carcass was divided in the usual manner and various cuts were trimmed to provide pieces of different sizes for use in the experiment. Counts of trichina larvae were made on samples obtained from various parts of the carcass. On direct microscopic examination of press preparations, the diaphragm was found to contain an average of 299 larvae per gram, a ham 248 per gram, a shoulder 261 per gram, and a loin 128 per gram. Digestion of 50 grams of diaphragm in artificial gastric juice revealed an average of 303 larvae per gram. Between the time of butchering on July 29 and the time of the first experiment on August 4 and the second on August 10, the pork was kept in a cold room maintained at 10° C. On the day of each experiment the pork was removed from the cold room and was exposed to air temperatures for approximately 3 hours before cooking. Consequently, the samples had lost most of their chill at the time they were introduced into the garbage in the cooker.

The size and thickness of the pork samples were restricted somewhat by the size of the cuts available. Data concerning the dimensions, cubic measurement, and weight of the samples in the various experiments are given in table 1. Discrepancies in the weight of samples having identical dimensions may be explained on the basis

TABLE 1.—*Dimensions, cubic measurement, and weight of samples of trichinous pork employed in garbage cooking experiments*

Sample number	Dimensions (*inches*)	Cubic measurement (*inches*)	Weight (*grams*)
SERIES I			
A-1	6×6×4.5	162	2207
A-2	5×5×4.5	112.5	1133
A-3	4×4×2.5	40	477
A-4	3×3×3	27	331
A-5	2×2×2	8	169
A-6	1×1×1	1	24
B-1	6×6×4.5	162	2249
B-2	5×5×2.5	62.5	1102
B-3	4×4×2.5	40	451
B-4	3×3×3	27	314
B-5	2×2×2	8	169
B-6	1×1×1	1	24
C-1	6×6×4.5	162	2297
C-2	5×5×2	50	792
C-3	4×4×3	48	466
C-4	3×3×3	27	340
C-5	2×2×2	8	159
C-6	1×1×1	1	28
E-1	4×4×2.5	40	781
E-2	3×3×3	27	394
E-3	2×2×2	8	156
E-4	1×1×1	1	25
F-1	4×4×2.5	40	693
F-2	3×3×3	27	367
F-3	2×2×2	8	155
F-4	1×1×1	1	20
SERIES II			
D-1	6×5×3	90	1568
D-2	6×6×2.5	90	1092
D-3	4×3×3.5	42	487
D-4	3×3×3	27	488
D-5	3×3×3	27	485
G-1	6×5×4	120	2056
G-2	5×4×3	60	666
H-1	3×3×3	27	342

of texture of the cut and the presence or absence of bone. Each sample was wrapped in cheese cloth and a heavy cord attached so that the sample could be removed at will from the cooker. A meat thermometer was inserted into the center of each sample and kept there during the entire course of the experiments. Temperature readings were made at intervals in accordance with the plan of the experiment, as explained later. The thermometers were furnished through the cooperation of Miss Lucy Alexander, Bureau of Home Economics, United States Department of Agriculture. Each thermometer had been tested and calibrated by the United States Bureau of Standards and correction figures were available.

Following the cooking of the trichinous pork in the garbage, the samples were brought to the laboratory. The following day they were ground in a food chopper and a composite 50-gram sample, or as much as was available, was fed to 5 albino rats which had previously

been tattooed with the sample number. In addition, in those samples in which this amount remained, a composite 50-gram sample was digested in artificial gastric juice overnight in the warm room at 37° C., during which time it was stirred constantly by a motorized mechanical stirring apparatus. On the following day counts of larvae were made on the samples after the supernatant fluid had been siphoned off.

In the two series of experiments the rats were killed 46 and 48 days, respectively, after date of infection. The diaphragms were examined for trichinae, the skinned and eviscerated carcasses were ground in a food chopper, and a composite 50-gram sample was digested in artificial gastric juice overnight in the same manner as indicated above. The following day larval counts were made on each sample. A series of control samples was handled in exactly the same manner except that these samples were not cooked but were maintained in the cold room until used. Some of the rats receiving trichinous meat from some of the samples died during the period of the experiment. In a few cases, the carcasses were badly decomposed because death occurred over the week end, while in other cases the carcasses were consumed by other rats in the cage. Whenever possible, rats which succumbed during the experiment were examined for adult and larval trichinae.

In making counts of larvae in the samples of cooked pork and the trichinous rats, total counts were made when the number of larvae was relatively small. In other cases dilution counts were conducted, 5 counts on quantities of 2 cc. each being made from 200 cc. of the digest containing all the larvae from pork samples and a similar number of counts on similar samples from 1,000 cc. of the digest containing the larvae from the rats. The figures given in the tables are the mean of the respective counts. With the inherent errors in dilution counting in general and the small number of samples taken in the present case, naturally the figures are not statistically significant. However, neither the objectives of the experiment nor the conclusions derived demand statistical validity and the counts are given merely to show roughly the relative degree of infection.

SERIES I

Five lots of samples were employed in this series of experiments. Sample lots A, B, E, and F were cooked with the garbage while sample lot C was used as a control. The experimental samples were distributed throughout the tank and immersed in the garbage so that they were entirely covered. The samples were placed in the garbage while it was still cold and before steam was turned into the tank. Samples in lot A were removed from the tank 30 minutes after the garbage came to a boil; samples in lot B were removed at 20 minutes; samples in lot E at 15 minutes; and samples in lot F at 10 minutes. Temper-

ature readings were first taken at the time of removal of the various samples from the cooking tank and thereafter at 5-minute intervals until no further rise was noted. Table 2 gives information concerning the temperatures reached in the interior of the samples. Correction figures for the thermometers have not been recorded since these figures were so small as not to influence the correlations or results.

During the early stages of cooking it was noted that the temperature in different parts of the garbage showed considerable variation. Pockets were formed in the mass of garbage through which the steam escaped to the surface. In these pockets the temperature reached

TABLE 2.—*Temperature reached in the interior of samples of trichinous pork in garbage at various intervals after the material began to boil (series I)*

[Temperature ° C.]

Sample number	Intervals in minutes after material came to boil									
	10	15	20	25	30	35	40	45	50	55
A-1					34	35	35	35	37	36
A-2					38	43	46	48	50	50
A-3					33	37	37	35		
A-4					38	42	44	50		37
A-5					78	79	74	66	49	
A-6					98	83	66	56		
B-1			23	23	22	22				
B-2			55	56	56	56	55			
B-3			22	24	25	25				
B-4			52	57	61	62	55			
B-5			74	78	75	68				
B-6			100	80	56	48				
E-1		42	44	45	46	46				
E-2		23	27	28	28					
E-3		28	29	30	31					
E-4		94	81	60	58					
F-1	22	22	21	21						
F-2	33	38	46	46						
F-3	67	70	68	62						
F-4	35	30	30	28						

100° C. while in other areas, particularly in the distal portion of the tank away from the steam inlet, the temperature failed to register to the boiling point. These discrepancies disappeared as the cooking progressed. However, since the experimental cooking time was reckoned from the moment the garbage first began to boil, there was some variation in the temperature in various parts of the garbage at this period and such variation no doubt influenced the result in the case of some of the samples.

It will be seen from table 3 that there was no close correlation between the destruction of the larvae and the size of the various samples in the lots cooked for different periods of time. In fact, most consistent results were obtained in lot B samples, of which 4 of the 6 samples produced no infection in the rats even though lot B samples were in boiling garbage for only 20 minutes whereas lot A samples were held for 30 minutes. However, all samples which reached an

TABLE 3.—*Results of examination for trichinae of 50-gram composite samples of voluntary muscle from rats fed trichinous meat cooked with garbage (series I)*

Sample number	Number of rats dying before end of experiment	Findings of trichinae in dead rats	Number of rats examined at end of experiment	Larvae recovered from 50-gram sample from rats		Number larvae per gram in pork fed to rats		Highest temperature (° C.) reached in cooked pork fed to rats
				Total number	Number per gram	Coiled	Uncoiled	
A–1	4	Adults	1	None	None	70	16	37
A–2	0		5	16	0.32	2	7	50
A–3	0		4	316,400	6,328	171	28	37
A–4	0		5	1,140	22.8	3	8	50
A–5	0		5	None	None	None	[1] None	79
A–6	2	None	3	None	None	No sample		98
B–1	3	Adults	1	131,860	2,637	46	41	23
B–2	1	None	3	None	None	None	25	56
B–3	1	904,600	4	331,360	6,627	120	16	25
B–4	2	None	3	None	None	2	24	62
B–5	0		5	None	None	None	None	78
B–6	2	Rats eaten	3	None	None	No sample		100
C–1	0		5	281,600	5,632	No digest		Control; not cooked.
C–2	5	481,200 to 844,400	0					
C–3	3	209,600 to 1,685,000	1	63,000	1,260			
C–4	4	113,200 to 1,212,400	1	181,600	3,632			
C–5	2	Adults	3	72,833	1,456			
C–6	3	Adults and larvae	2	203,000	4,060			
E–1	2	1—no adults; 2—86,812	3	170,700	3,414	22	50	46
E–2	3	82,000 to 632,200	2	391,000	7,820	8	12	28
E–3	5	Adults in 1; larvae in 3	0			22	17	31
E–4	1	None	[2] 3	16	0.32	No sample		94
F–1	2	Adults	3	111,800	2,236	56	17	22
F–2	0		5	122,800	2,456	33	13	46
F–3	2	None	3	None	None	None	4	70
F–4	1	Rat eaten	4	56,800	1,136	No sample		35

[1] Only digested fragments of larvae were recovered from this sample.
[2] Diaphragms of these 3 rats were negative for trichina larvae; finding of larvae in the 50-gram composite sample was probably due to contamination from infected sample.

internal temperature of 56° C. or more failed to produce infection in rats. The results with sample E–4 are anomalous in view of the internal temperature reached. The diaphragms of the 3 rats were free of trichinae, and contamination during examination of the digested material was ruled out by the fact that separate pieces of sterile glassware were used for each sample. The 16 larvae recovered from the digest were coiled and viable and obviously represented a contamination which was later traced to a probable inadvertence on the part of the attendant who prepared the various samples for digestion.

The variable results obtained in this experiment were no doubt due to conditions previously mentioned wherein the temperature reached in various parts of the tank varied considerably during the early stages of the cooking. A temperature of 100° C. was recorded more generally in the proximal portion of the tank near the steam inlet than toward the rear of the tank in spite of the fact that the steam

line reached to the farther end of the receptacle. Even in the proximal portion, however, some parts of the garbage had not come to a boil even though portions in the distal end were already boiling. No doubt heat distribution would have been more uniform throughout had the material been stirred at intervals in accordance with the usual custom at this plant. Stirring could not be carried out during the experiment because of the danger of misplacing the samples and breaking the thermometers inserted therein. Furthermore, had the samples been placed deeper in the mass of garbage instead of in the top layer, no doubt a higher internal temperature would have been reached.

SERIES II

In this series of experiments the samples were handled in the same manner as those in series I with the exception that the steam was turned off after the garbage had boiled for 30 minutes. The samples were then allowed to remain in the tank for an additional period of 60 minutes while the garbage was cooling. It was necessary to remove the samples after this elapsed time in order not to disrupt the routine of the plant since the tank was needed for cooking additional lots of garbage during the day. The procedure employed in this experiment was in keeping with the usual method of handling cooked garbage in hog feeding plants, since it is customary to allow the garbage to cool in the cooking vat or other receptacle before feeding it to hogs.

Table 4 is a record of the internal temperatures reached in the various samples while table 5 gives the results of the cooking tests. In this experiment the temperatures recorded in the various samples 30 minutes after the garbage came to a boil showed the same marked variations as recorded in the series I experiment. However, after the steam was turned off, the internal temperature of the samples rose consistently until it was sufficient to destroy all trichinae with the

TABLE 4.—*Temperature reached in the interior of samples of trichinous pork in garbage at various intervals after the material began to boil (series II)*

[Temperature ° C.]

Sample number	Intervals in minutes after material came to boil								
	30	40	50	60	70	80	90	[1] 110	[1] 115
D-1	22	23	32	39	46	57	59	64	64
D-2	70	76	78	80	82	83	84	78	----
D-3	28	36	48	52	66	70	76	74	----
D-4	78	80	82	84	86	89	86	60	----
D-5	65	71	80	87	86	86	75	68	----
G-1	*Below* [2] 30	*Below* [2] 30	*Below* [2] 30	30	38	43	49	52	52
G-2	68	69	78	82	85	86	86	80	----

[1] All samples were removed from the cooking vat at 90 minutes after the garbage started to boil. The temperatures recorded for 110 and 115 minutes were those reached after the samples were in the open air.

[2] In sample G-1 the mercury was below the level of the surface of the meat and the lower temperatures could not be read.

TABLE 5.—*Results of examination for trichinae of 50-gram composite samples of voluntary muscle from rats fed trichinous meat cooked with garbage (series II)*

Sample number	Number of rats dying before end of experiment	Findings of trichinae in dead rats	Number of rats examined at end of experiment	Larvae recovered from 50-gram sample from rats		Number larvae per gram in pork fed to rats		Highest temperature (° C.) reached in cooked pork fed to rats
				Total number	Number per gram	Coiled	Uncoiled	
D–1	None		5	None	None	None	9	64
D–2	None		5	None	None	None	None [1]	84
D–3	None		5	None	None	None	None [1]	76
D–4	1	Badly decomposed	4	None	None	None	None [1]	89
D–5	None		5	None	None	None	None [1]	87
G–1	None		5	50,500	1,010	17	50	52
G–2	None		5	None	None	None	None [1]	86
H–1	1	680,200	4	123,200	2,464	39	207 [2]	Control; not cooked.

[1] Only digested fragments of larvae were recovered in these samples.
[2] Most of these larvae were coiled and very active when first isolated; they uncoiled during the course of the day while being collected in cold water so that counts could be made of the total number isolated.

exception of those in the largest sample (G–1). However, the internal temperature within this sample increased after the sample was removed from the cooking tank and it seems probable that the temperature would have reached 55° C., the lethal temperature for trichina larvae, had the sample been allowed to remain in the garbage while further cooling was taking place. In view of this probability and the fact that all larvae were killed in cuts of pork having a thickness up to 3 inches, it would seem that the boiling of garbage for a period of 30 minutes and permitting it to cool before feeding the material to swine would constitute a procedure sufficient for the destruction of trichinae in pieces of pork contained therein. However, in arriving at this conclusion one should not ignore the possibility of a less rapid penetration of heat into scraps of pork previously cooked, a matter concerning which little or no information is available.

In spite of this possibility, by and large, the size of the pork samples employed in these experiments probably exceeded the size of pork scraps commonly encountered in garbage. For this reason it is believed that the conditions set up in these experiments were sufficiently severe to provide data which could be interpreted with an adequate margin of safety for the purpose of formulating regulations for the control of trichinosis.

SUMMARY AND CONCLUSIONS

In order to determine the minimum time required for the cooking of garbage to destroy trichinae in pork scraps contained therein, tests were carried out by introducing into garbage cooked by steam in an open tank pieces of trichinous pork varying in dimensions from 1 x 1 x 1 inch to 6 x 6 x 4.5 inches and in weight between 20 grams

(0.04 pound) and 2,297 grams (5.06 pounds). The samples were placed in the garbage while it was still cold and before the steam was turned into the tank. In series I, the samples were held in the tank for respective periods of 10, 15, 20, and 30 minutes after the garbage came to a boil. In series II experiments, the samples were introduced into the cold garbage, the steam was turned off after the garbage had boiled for 30 minutes, and the samples were not removed until 60 minutes later. The internal temperature of each sample was ascertained by means of a meat thermometer inserted into the center of the sample. Representative samples from the cooked pork and uncooked control samples were digested in artificial gastric juice and examined for trichina larvae while other samples were fed to rats which were killed after a suitable period and examined for larvae.

In the series I experiments considerable variation was noted in the degree of internal heat reached within the pieces of pork and such variation was not always correlated with the size of the sample or the length of cooking. The variation was no doubt due to the fact that the temperature throughout the mass of the garbage was not uniform. The fact that the garbage was not stirred during the course of the experiment probably accounted in part for the uneven temperature distribution.

In the series II experiments, all larvae were killed in all samples with the exception of the largest which measured 6 x 5 x 4 inches and weighed 2,056 grams (4.5 pounds). In both series of experiments no larvae survived when the internal temperature of the sample reached 56° C.

The results of these experiments warrant the conclusion that the boiling of garbage for 30 minutes in an open container will effect the destruction of trichina larvae in pieces of pork up to 3 inches in thickness and probably in pieces of pork of greater thickness provided the garbage is allowed to cool gradually. Such procedure would seem to constitute an effective measure for preventing the transmission of trichina infection to swine maintained on garbage and thus aid in the control of swine trichinosis primarily and human trichinosis secondarily.

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INFECTIOUS HEPATITIS AND INFECTIOUS KERATO-CONJUNCTIVITIS PROVISIONALLY ADDED TO MANUAL "CONTROL OF COMMUNICABLE DISEASES"

The importance has recently been recognized of two communicable diseases not previously included in the manual "Control of Communicable Diseases" sponsored jointly by the Public Health Service and the American Public Health Association (Reprint No. 1697 from the Public Health Reports, revised 1940). These two diseases are infectious hepatitis (formerly known as acute catarrhal jaundice) and infectious kerato-conjunctivitis (also known as superficial punctate keratitis or nummular keratitis). At a recent meeting of the committee which prepared the 1940 revision, it was recommended that these two diseases be added to the manual. Descriptions follow:

Hepatitis, Infectious (Acute Catarrhal Jaundice)

1. *Recognition of the disease.*—An acute infection characterized by a prodromal period of from less than a day to about a week, following which jaundice of more or less severity occurs. The prodromal symptoms include headache, abdominal pain, malaise, anorexia, nausea, and vomiting. Fever is usually present although it may be so slight as to be missed. Toward the end of this period bile may be detected in the urine, and jaundice of minimal to marked intensity is soon noted, persisting for days or weeks. A leukopenia with relative lymphocytosis may be present. Convalescence is of variable length. There is considerable variation in the degree of severity of the disease, ranging from anicteric cases to cases of acute yellow atrophy of the liver. A similar clinical picture has been observed following certain industrial intoxications, antisyphilitic treatment, and several immunization procedures, but the relation of these clinical conditions to infectious hepatitis has not been determined.
2. *Etiological agent.*—Unknown.
3. *Source of infection.*—Probably discharges from the nose and mouth of infected individuals. There may be carriers.
4. *Mode of transmission.*—Presumably through direct contact with infected persons and carriers of the disease. Alimentary infection may be a factor but the evidence in this direction is scanty.
5. *Incubation period.*—Usually from 21 to 35 days.
6. *Period of communicability.*—Relatively short. About 1 week and apparently not more than 2 weeks.
7. *Susceptibility and immunity.*—Most common among children. Cases have been observed among individuals of all age groups. The disease is, in most instances, of longer duration and greater severity among adults than among children. Second attacks have been rare, relapses uncommon.
8. *Prevalence.*—Epidemics are most commonly reported from rural areas and from institutions. Most outbreaks begin during the fall and winter months.
9. *Methods of control:*
   - A. The infected individual, contacts, and environment.
     1. Recognition of the disease and reporting: By clinical symptoms.
     2. Isolation: During the first week of illness.
     3. Concurrent disinfection: Discharges of nose and throat of patient.
     4. Terminal disinfection: None.
     5. Quarantine: None.
     6. Immunization: None.
     7. Investigation of source of infection: Desirable to detect and isolate other cases.
   - B. General measures:
     Physicians of the vicinity should be informed when this disease is prevalent.

Kerato-Conjunctivitis, Infectious (Superficial Punctate Keratitis; Nummular Keratitis)

1. *Recognition of the disease.*—Acute onset usually with sensation as of foreign body under the upper lid. Edema of lids, scleral injection, follicular hypertrophy of palpebral conjunctiva, enlargement and tenderness of pre-auricular lymph node with a watery discharge, followed in few or many of the cases by multiple pin-point corneal opacities. Involvement usually unilateral.
2. *Etiological agent.*—Considered to be a specific filterable virus.
3. *Source of infection.*—Probably the discharge from the eye of an infected person or a carrier.
4. *Mode of transmission.*—Apparently contact with an infected person or carrier or with articles freshly soiled with discharges of such person.
5. *Incubation period.*—Not definitely established but probably about 5 days.
6. *Period of communicability.*—Unknown but certainly during acute stage of the disease.
7. *Susceptibility and immunity.*—Susceptibility variable. No age, sex, or race known to be immune.
8. *Prevalence.*—Occurs in epidemic form in warm climates, also among industrial employees in temperate climates, involving a small percentage of the individuals in the groups affected.
9. *Methods of control:*
   - A. The infected individual, contacts, and environment:
     1. Recognition of the disease: Clinical course confirmed by smears of conjunctival scrapings showing mononuclear cells and none of the usual etiologic agents of other forms of conjunctivitis.
     2. Isolation: None, provided hygienic measures are taken by the infected person.
     3. Concurrent disinfection: Disinfection or destruction of conjunctival and nasal disharges and articles soiled therewith.
     4. Terminal disinfection: None.
     5. Quarantine: None.
     6. Immunization: None.
     7. Investigation of source of infection: To locate other cases and institute precautions at home or working place.
   - B. General measures:
     1. Education as to personal cleanliness and as to danger of use of common towels and toilet articles.
     2. Avoidance of contact of hands with conjunctival or nasal discharges.

DEATHS DURING WEEK ENDED FEBRUARY 20, 1943

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 20, 1943	Corresponding week, 1942
Data from 87 large cities of the United States:		
Total deaths	10,267	9,399
Average for 3 prior years	9,254	
Total deaths, first 7 weeks of year	70,639	64,661
Deaths under 1 year of age	673	573
Average for 3 prior years	527	
Deaths under 1 year of age, first 7 weeks of year	4,977	3,912
Data from industrial insurance companies:		
Policies in force	65,363,449	64,912,414
Number of death claims	13,574	14,116
Death claims per 1,000 policies in force, annual rate	10.8	11.3
Death claims per 1,000 policies, first 7 weeks of year, annual rate	10.7	10.2

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED FEBRUARY 27, 1943

Summary

For the current week 484 cases of meningococcus meningitis were reported (exclusive of a delayed report of 19 cases in Virginia), as compared with 398 for the preceding week and 403 for the next earlier week. The accumulated total for the first 8 weeks of the year is 2,959, nearly seven times the comparable 5-year (1938–42) median (437). The largest number of cases recorded for the comparable period of the past 16 years was 1,942, reported in the first 8 weeks of 1930. The current reports show increases in all of the nine geographic divisions except the New England, East North Central, and Pacific groups. States reporting the largest numbers were New York 43, California 36, New Jersey 35, Pennsylvania 30, Missouri and Virginia 27 each, Mississippi 23, and Alabama 21.

There were 17,754 cases of measles reported for the week, as compared with 16,334[1] for the preceding week and a 5-year median of 16,918. The largest numbers continued to be reported in the three Middle Atlantic States—Pennsylvania 3,398, New York 1,596, and New Jersey 1,109. The accumulated total for the first 8 weeks of the year is 96,436, as compared with the corresponding 5-year median of 97,528, the number reported for this period in 1942.

Increased incidence as compared with the preceding week was shown in the reports of diphtheria, 294 cases, influenza, 5,096, scarlet fever, 4,365, and whooping cough, 3,898, although the figures for these diseases are below the respective 5-year medians.

Other reports for the week included 1 case of anthrax, 386 cases of dysentery, 9 of infectious encephalitis, 16 of tularemia, and 37 cases of endemic typhus fever.

Deaths in 89 large cities of the United States for the week totaled 10,290, as compared with 10,336 for the preceding week. The accumulated total for the first 8 weeks of the year is 81,377, as compared with 74,203 for the corresponding period in 1942.

[1] Later information shows a total of 16,334 cases of measles for the week ended Feb. 20, 1943, instead of 15,482 as stated in the summary for that week. (See p. 364, PUBLIC HEALTH REPORTS, Feb. 26, 1943.)

Telegraphic morbidity reports from State health officers for the week ended February 27, 1943, and comparison with corresponding week of 1942 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occured.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1938–42	Week ended—		Median 1938–42	Week ended—		Median 1938–42	Week ended—		Median 1938–42
	Feb. 27, 1943	Feb. 28, 1942		Feb. 27, 1943	Feb. 28, 1942		Feb. 27, 1943	Feb. 28, 1942		Feb. 27, 1943	Feb. 28, 1942	
NEW ENG.												
Maine	0	0	0	1	9	9	8	177	138	17	1	0
New Hampshire	0	1	0	----	----	----	51	8	15	0	2	0
Vermont	0	0	0	----	----	----	349	4	5	1	0	0
Massachusetts	1	2	2	----	----	----	743	411	376	13	5	2
Rhode Island	0	1	0	1	1	----	34	176	15	17	0	1
Connecticut	1	1	1	1	3	5	437	238	185	4	6	0
MID. ATL.												
New York	22	27	26	[1] 10	[1] 13	[1] 44	1,596	723	1,273	43	11	5
New Jersey	1	3	10	10	15	42	1,109	208	208	35	2	1
Pennsylvania	16	12	25	5	----	----	3,398	1,027	1,027	30	3	5
E. NO. CEN.												
Ohio	7	10	17	10	24	24	217	177	177	6	3	1
Indiana	3	6	13	40	21	29	421	87	87	5	1	0
Illinois	13	19	23	31	12	54	553	376	376	12	3	2
Michigan [2]	4	4	7	----	----	2	285	150	447	12	0	0
Wisconsin	1	0	2	49	63	183	834	510	662	6	0	0
W. NO. CEN.												
Minnesota	5	6	1	----	3	7	42	758	291	0	0	0
Iowa	2	4	4	2	8	42	276	289	159	1	0	0
Missouri	7	3	8	3	4	42	423	400	78	27	1	1
North Dakota	0	0	1	20	6	23	67	42	12	0	0	0
South Dakota	4	1	1	1	----	1	107	7	5	0	1	0
Nebraska	5	3	3	39	----	----	247	108	33	1	0	0
Kansas	5	3	4	6	17	45	320	343	322	5	2	0
SO. ATL.												
Delaware	0	4	1	1	----	----	25	2	2	1	0	0
Maryland [2]	4	1	2	4	21	103	38	385	77	15	6	2
Dist. of Col	0	0	5	2	2	8	94	44	19	2	2	1
Virginia	10	15	17	803	987	1,604	436	177	223	[3] 46	6	3
West Virginia	2	4	8	15	42	69	17	352	189	3	5	3
North Carolina	11	10	10	50	36	64	56	1,606	1,430	13	0	0
South Carolina	6	3	4	986	950	950	44	260	237	9	1	1
Georgia	6	2	5	106	147	147	65	419	349	3	0	1
Florida	10	3	5	4	13	13	20	222	145	12	0	0
E. SO. CEN.												
Kentucky	7	5	9	11	104	115	865	55	55	9	1	2
Tennessee	4	3	7	57	----	152	316	226	133	11	5	3
Alabama	11	6	13	389	620	620	60	172	258	21	3	3
Mississippi [2]	9	9	6	----	----	----	----	----	----	23	1	1
W. SO. CEN.												
Arkansas	5	11	9	102	395	286	122	314	107	4	1	1
Louisiana	7	1	6	12	11	11	99	83	18	4	1	1
Oklahoma	6	6	6	155	93	218	57	393	83	5	1	1
Texas	34	36	38	1,606	1,667	1,667	697	1,843	414	16	7	1
MOUNTAIN												
Montana	2	3	2	----	11	11	129	125	33	1	1	0
Idaho	4	1	1	----	----	1	88	34	34	1	0	0
Wyoming	0	0	2	85	302	----	147	119	36	0	1	0
Colorado	12	1	8	53	64	61	445	228	147	3	1	1
New Mexico	0	0	1	5	1	3	28	112	81	2	0	0
Arizona	1	3	3	147	156	156	14	182	21	3	0	0
Utah [2]	0	0	0	103	13	19	384	111	155	3	0	0
Nevada	0	0	----	----	----	----	6	61	----	5	0	----
PACIFIC												
Washington	3	2	2	----	3	3	999	111	141	11	0	1
Oregon	1	2	2	80	21	37	505	132	132	6	0	0
California	42	6	23	91	126	126	451	2,931	408	36	3	2
Total	294	243	369	5,096	5,984	8,987	17,754	16,918	16,918	[3] 503	87	51
8 weeks	2,480	2,639	3,395	36,354	39,064	39,064	96,436	97,528	97,528	2,959	503	437

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended February 27, 1943, and comparison with corresponding week of 1942 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1938–42	Week ended—		Median 1938–42	Week ended—		Median 1938–42	Week ended—		Median 1938–42
	Feb. 27, 1943	Feb. 28, 1942		Feb. 27, 1943	Feb. 28, 1942		Feb. 27, 1943	Feb. 28, 1942		Feb. 27, 1943	Feb. 28, 1942	
NEW ENG.												
Maine	0	0	0	14	13	13	0	0	0	0	0	0
New Hampshire	0	1	0	13	34	4	0	0	0	0	2	0
Vermont	0	0	0	12	27	13	0	0	0	0	2	0
Massachusetts	0	1	0	531	318	233	0	0	0	1	2	1
Rhode Island	0	2	0	18	24	16	0	0	0	0	0	0
Connecticut	0	0	0	80	37	100	0	0	0	0	1	1
MID. ATL.												
New York	0	1	1	645	423	721	0	0	0	5	5	5
New Jersey	1	2	1	134	161	187	0	0	0	1	0	0
Pennsylvania	0	1	1	277	535	535	0	0	0	3	3	5
E. NO. CEN.												
Ohio	1	4	0	275	318	318	0	0	4	3	2	4
Indiana	1	0	1	108	186	186	3	0	2	0	4	2
Illinois	0	1	1	261	327	491	3	0	6	4	1	3
Michigan [2]	1	0	1	124	241	272	0	0	0	1	0	3
Wisconsin	0	1	1	291	170	174	1	1	5	1	0	0
W. NO. CEN.												
Minnesota	1	0	0	68	117	117	0	0	6	0	1	0
Iowa	0	0	0	103	71	102	1	3	10	0	0	1
Missouri	0	0	0	133	146	97	0	2	4	1	1	1
North Dakota	0	0	0	11	30	27	0	0	1	0	0	0
South Dakota	0	0	0	9	34	22	2	1	1	0	0	0
Nebraska	0	0	0	47	98	47	0	0	0	0	0	0
Kansas	0	0	0	73	117	117	3	0	3	1	0	0
SO. ATL.												
Delaware	0	0	0	7	39	16	0	0	0	0	0	0
Maryland [2]	0	0	0	102	62	62	0	0	0	0	1	0
Dist. of Col	0	0	0	35	12	18	0	0	0	0	0	0
Virginia	2	0	2	44	40	40	0	0	0	1	1	2
West Virginia	1	0	1	47	43	44	0	0	0	2	2	2
North Carolina	0	2	2	25	44	47	0	0	0	0	1	1
South Carolina	0	1	0	5	8	5	0	0	0	2	1	3
Georgia	0	0	0	26	20	19	0	0	0	5	14	2
Florida	0	1	1	29	5	5	0	0	0	0	6	2
E. SO. CEN.												
Kentucky	0	0	0	45	73	84	1	1	1	0	1	3
Tennessee	0	1	0	85	80	80	0	1	1	5	3	2
Alabama	0	0	0	18	37	23	0	2	1	1	1	2
Mississippi [2]	0	1	1	12	10	9	0	0	0	2	1	1
W. SO. CEN.												
Arkansas	0	2	1	6	6	9	0	2	2	1	1	1
Louisiana	0	1	0	12	7	12	0	0	0	5	3	7
Oklahoma	0	0	0	28	32	20	0	0	1	2	2	0
Texas	1	3	2	66	55	58	0	1	4	0	2	5
MOUNTAIN												
Montana	0	1	0	22	15	33	0	0	0	0	0	0
Idaho	0	0	0	2	3	10	0	0	0	0	0	0
Wyoming	0	0	0	102	44	8	0	1	0	0	0	0
Colorado	0	0	0	106	42	42	0	0	14	0	0	0
New Mexico	2	0	0	7	3	11	1	0	0	3	0	0
Arizona	0	0	0	12	6	9	0	1	1	1	0	0
Utah [2]	1	0	0	66	43	37	0	0	0	0	0	0
Nevada	0	0	------	2	0	------	0	0	------	0	0	------
PACIFIC												
Washington	0	0	1	62	40	53	0	0	1	0	0	0
Oregon	0	0	0	12	18	24	0	0	0	1	0	1
California	3	2	2	153	125	156	0	0	0	1	1	3
Total	15	29	25	4,365	4,339	4,911	15	16	65	53	65	78
8 weeks	230	209	209	30,413	30,265	35,766	231	170	573	409	645	645

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended February 27, 1943, and comparison with corresponding week of 1942 and 5-year median—Continued.

Division and State	Whooping cough			Week ended Feb. 27, 1943								
	Week ended—		Median 1938–42	Anthrax	Dysentery			Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularemia	Typhus fever
	Feb. 27, 1943	Feb. 28, 1942			Amebic	Bacillary	Unspecified					
NEW ENG.												
Maine	53	37	27	0	0	0	0	0	0	0	0	0
New Hampshire	5	0	1	0	0	0	0	0	0	0	0	0
Vermont	7	68	23	0	0	0	0	0	0	0	0	0
Massachusetts	138	125	125	0	0	0	0	0	0	0	0	0
Rhode Island	31	47	39	0	0	0	0	0	0	0	0	0
Connecticut	62	60	60	0	0	0	0	0	0	0	0	0
MID. ATL.												
New York	310	422	410	0	2	6	0	2	0	0	0	0
New Jersey	176	215	166	0	0	0	0	0	0	0	0	0
Pennsylvania	352	0	295	1	0	0	0	1	0	0	0	0
E. NO. CEN.												
Ohio	203	177	177	0	0	0	0	0	0	0	2	0
Indiana	61	59	25	0	0	0	0	0	0	0	0	0
Illinois	131	163	105	0	1	1	0	1	0	0	0	0
Michigan [3]	228	137	197	0	0	0	0	0	0	0	0	0
Wisconsin	223	199	146	0	0	0	0	0	0	0	0	0
W. NO. CEN.												
Minnesota	67	40	38	0	0	0	0	0	0	0	0	0
Iowa	19	12	24	0	0	0	0	0	0	0	0	0
Missouri	16	32	32	0	0	0	0	1	0	0	0	0
North Dakota	13	13	10	0	0	0	0	0	0	0	0	0
South Dakota	0	7	4	0	0	0	0	0	0	0	0	0
Nebraska	14	12	12	0	0	0	0	0	0	0	0	0
Kansas	43	39	39	0	0	0	0	0	0	0	0	0
SO. ATL.												
Delaware	15	0	5	0	0	0	0	0	0	0	0	0
Maryland [3]	110	46	48	0	0	0	2	0	0	0	0	0
Dist. of Col	26	25	17	0	0	0	0	0	0	0	0	0
Virginia	130	47	65	0	0	0	17	0	0	0	1	1
West Virginia	39	25	27	0	0	0	0	0	0	0	0	0
North Carolina	155	126	266	0	3	0	0	0	0	0	0	1
South Carolina	40	58	68	0	0	1	0	0	0	0	1	4
Georgia	32	8	23	0	0	0	0	0	0	0	4	5
Florida	23	14	14	0	1	0	0	0	0	0	0	3
E. SO. CEN.												
Kentucky	34	53	53	0	0	2	0	0	0	0	0	0
Tennessee	62	55	55	0	0	0	0	0	0	0	3	1
Alabama	77	25	32	0	0	0	0	0	0	0	0	11
Mississippi [3]				0	0	0	0	0	0	0	0	0
W. SO. CEN.												
Arkansas	29	6	10	0	0	1	0	0	0	0	1	0
Louisiana	4	2	12	0	2	0	0	0	0	0	2	4
Oklahoma	15	13	13	0	0	0	0	0	0	0	0	0
Texas	472	78	111	0	7	317	0	2	0	0	2	6
MOUNTAIN												
Montana	36	12	15	0	0	0	4	0	0	0	0	0
Idaho	0	5	12	0	0	0	0	0	0	0	0	0
Wyoming	2	4	4	0	0	0	0	0	0	0	0	0
Colorado	18	40	40	0	0	0	0	0	0	0	0	0
New Mexico	15	31	23	0	0	0	1	0	0	0	0	0
Arizona	15	46	37	0	0	0	14	1	0	0	0	0
Utah [3]	25	19	23	0	0	0	0	0	0	0	0	0
Nevada	1	4		0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	24	104	101	0	0	0	0	0	0	0	0	0
Oregon	15	31	26	0	0	0	0	0	0	0	0	0
California	332	247	247	0	2	2	0	1	0	0	0	1
Total	3,898	2,988	3,947	1	18	330	38	9	0	0	16	37
8 weeks	30,944	32,255	32,255									

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Delayed report of 19 cases in Virginia included.

WEEKLY REPORTS FROM CITIES

City reports for week ended February 13, 1943

This table lists the reports from 88 cities of more than 10,000 population distributed throughout the United States, and represents a cross-section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
Atlanta, Ga	1	0	39	1	14	1	2	0	7	0	0	4
Baltimore, Md	2	0	5	2	11	9	21	0	53	0	0	54
Barre, Vt	0	0	------	0	0	0	0	0	0	0	0	0
Billings, Mont	0	0	------	0	0	0	2	0	0	0	0	0
Birmingham, Ala	0	0	5	0	0	0	5	0	4	0	0	0
Boise, Idaho	0	0	------	0	2	0	0	0	2	0	0	0
Boston, Mass	0	0	------	1	174	3	24	0	161	0	0	31
Bridgeport, Conn	0	0	------	0	5	0	0	0	6	0	0	0
Brunswick, Ga	0	0	1	0	0	0	1	0	0	0	0	0
Buffalo, N. Y	0	0	------	0	66	0	4	0	11	0	0	21
Camden, N. J	1	0	------	1	0	0	3	0	3	0	0	5
Charleston, S. C	0	0	52	0	4	3	3	0	4	0	0	1
Charleston, W. Va	0	0	------	0	1	0	0	0	0	0	0	0
Chicago, Ill	7	1	5	1	235	4	30	0	71	0	0	65
Cincinnati, Ohio	0	0	1	0	25	0	4	0	48	0	0	10
Cleveland, Ohio	0	0	2	1	5	2	10	0	27	0	0	62
Columbus, Ohio	1	0	------	0	2	0	6	0	12	0	0	3
Concord, N. H	0	0	------	0	1	0	1	0	0	0	0	0
Cumberland, Md	0	0	------	0	0	0	0	0	0	0	0	0
Dallas, Tex	0	0	------	0	0	0	5	0	3	0	0	12
Denver, Colo	3	0	17	0	218	1	10	0	7	0	0	5
Detroit, Mich	1	0	------	2	93	3	19	0	34	0	0	128
Duluth, Minn	0	0	------	0	1	0	0	0	2	0	0	4
Fall River, Mass	0	0	------	0	6	0	3	0	10	0	0	11
Fargo, N. Dak	0	0	------	0	0	0	0	0	0	0	0	0
Flint, Mich	1	0	------	0	3	0	1	0	1	0	0	7
Fort Wayne, Ind	0	0	------	1	0	0	3	0	1	0	0	0
Frederick, Md	0	0	------	0	0	0	0	0	0	0	0	0
Galveston, Tex	0	0	------	0	8	0	2	0	1	0	0	0
Grand Rapids, Mich	0	0	------	0	1	1	2	0	2	0	0	4
Great Falls, Mont	0	0	------	0	11	0	1	0	0	0	0	10
Hartford, Conn	0	0	1	0	19	0	1	0	2	0	0	0
Helena, Mont	0	0	------	0	16	0	0	0	0	0	0	0
Houston, Tex	5	0	------	1	0	0	8	1	3	0	0	2
Indianapolis, Ind	1	0	------	0	100	0	10	0	22	0	0	14
Kansas City, Mo	2	0	------	4	27	3	8	0	45	0	0	5
Kenosha, Wis	0	0	------	1	0	0	0	0	2	0	0	0
Little Rock, Ark	0	0	6	0	0	0	1	0	0	0	0	0
Los Angeles, Calif	3	0	23	4	58	4	11	2	13	0	0	30
Lynchburg, Va	0	0	------	0	2	0	0	0	0	0	0	3
Memphis, Tenn	0	0	2	4	19	1	3	0	5	0	0	19
Milwaukee, Wis	0	0	1	1	169	0	4	0	107	0	0	35
Minneapolis, Minn	0	0	------	0	17	1	6	0	5	0	0	19
Missoula, Mont	0	0	------	0	0	0	0	0	2	0	0	0
Mobile, Ala	0	0	------	1	0	0	6	0	0	0	0	0
Nashville, Tenn	0	0	------	0	45	0	6	0	8	0	0	0
Newark, N. J	0	0	3	0	25	1	6	0	7	0	0	12
New Haven, Conn	0	0	------	0	3	0	3	0	1	0	0	2
New Orleans, La	0	0	------	1	8	0	8	0	5	0	1	1
New York, N. Y	13	1	19	2	228	28	83	0	203	0	0	71
Omaha, Nebr	0	0	------	0	10	0	6	0	5	0	0	3
Philadelphia, Pa	1	0	2	1	1,089	6	41	0	89	0	0	53
Pittsburgh, Pa	0	0	10	9	0	0	12	0	9	0	1	20
Portland, Maine	0	0	------	0	2	13	4	0	8	0	0	21
Providence, R. I	0	0	2	0	36	8	10	0	12	0	1	12

City reports for week ended February 13, 1943—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
Pueblo, Colo	0	0	------	0	2	1	2	0	1	0	0	4
Racine, Wis	0	0	------	0	15	0	0	0	42	0	0	0
Raleigh, N. C	0	0	------	0	0	0	1	0	0	0	0	6
Reading, Pa	0	0	------	0	92	1	3	0	2	0	0	4
Richmond, Va	0	0	17	2	6	2	6	0	1	0	0	4
Roanoke, Va	0	0	------	0	0	0	1	0	0	0	0	0
Rochester, N. Y	0	0	------	0	23	1	3	0	8	0	0	34
Sacramento, Calif	3	0	------	0	3	0	4	0	6	0	0	4
St. Joseph, Mo	0	0	------	0	0	0	5	0	0	0	0	0
St. Louis, Mo	1	0	1	1	25	3	12	0	15	0	0	10
St. Paul, Minn	0	0	------	1	4	0	3	0	2	0	0	46
Salt Lake City, Utah	0	0	------	0	47	1	5	0	22	0	0	14
San Antonio, Tex	4	0	1	1	1	0	10	1	1	0	0	8
Savannah, Ga	0	0	35	0	0	0	1	0	0	0	0	0
Seattle, Wash	1	0	------	0	57	0	9	0	7	0	0	5
Shreveport, La	1	0	------	0	0	0	7	0	2	0	0	0
South Bend, Ind	0	0	------	0	8	0	0	0	1	0	0	0
Spokane, Wash	0	0	1	1	151	2	5	0	2	0	0	2
Springfield, Ill	0	0	------	0	6	0	2	0	11	0	0	27
Springfield, Mass	0	0	------	0	0	0	2	0	105	0	0	4
Syracuse, N. Y	0	0	------	1	16	2	6	0	7	0	0	11
Tacoma, Wash	3	0	------	0	42	1	0	0	0	0	0	0
Tampa, Fla	0	0	------	0	0	1	1	0	0	0	0	0
Terre Haute, Ind	0	0	------	0	0	0	5	0	2	0	0	1
Topeka, Kans	0	0	------	0	19	0	1	0	1	0	0	5
Trenton, N. J	0	0	------	0	23	0	3	0	13	0	0	1
Washington, D. C	0	0	3	3	88	6	11	0	28	0	1	17
Wheeling, W. Va	0	0	------	0	4	0	1	0	0	0	0	3
Wichita, Kans	0	0	------	0	14	0	4	0	2	0	0	4
Wilmington, Del	0	0	------	0	7	0	5	0	1	0	1	0
Wilmington, N. C	0	0	------	0	1	0	0	0	1	0	0	2
Winston-Salem, N. C	0	0	1	1	0	0	2	0	0	0	0	25
Worcester, Mass	0	0	------	0	130	5	7	0	14	0	0	8
Total	55	2	255	50	3,543	118	526	4	1,410	0	5	1,008
Corresponding week 1942	71	0	304	44	2,261	9	486	8	1,245	4	14	935
Average, 1938–42	110	------	1,024	[1] 101	[2] 3,992	------	[1] 624	------	1,415	22	17	1,050

Dysentery, amebic.—Cases: Los Angeles, 1.
Dysentery, bacillary.—Cases: Atlanta, 1; Boston, 6; Buffalo, 3; Chicago, 2; Los Angeles, 6; New York, 142.
Dysentery, unspecified.—Cases: Richmond, 1; San Antonio, 4.
Tularemia.—Cases: Nashville, 1.
Typhus fever.—Cases: Galveston, 1; Houston, 1.

[1] 3-year average, 1940-42.
[2] 5-year median.

PLAGUE INFECTION IN TACOMA, WASHINGTON

Plague infection has been reported proved in specimens of tissue and fleas from rats, *R. norvegicus*, collected in industrial areas in Tacoma, Wash., as follows: In 2 pooled specimens of tissue, each from 2 rats, taken on January 13 and February 4; in a pool of 9 fleas from 20 rats taken on February 8.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended January 30, 1943.—During the week ended January 30, 1943, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada, as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		16		194	349	70	43	34	88	794
Diphtheria		13	1	51	3	3	1		2	74
Dysentery (bacillary)				5						5
German measles				3	9		2	2	1	17
Influenza		32	13		2	7			15	69
Measles		8	1	76	74	31	119	16	46	371
Meningitis, meningococcus			1	4	3	2	1		2	13
Mumps		78	9	90	1,135	93	93	174	180	1,852
Poliomyelitis							1			1
Scarlet fever		5	13	139	116	9	15	36	31	364
Smallpox								1		1
Tuberculosis (all forms)	3	1	10	155	55	7		5	17	253
Typhoid and paratyphoid fever				6					1	7
Undulant fever					1					1
Whooping cough		6	2	123	123	49	1	43	27	374

CUBA

Habana—Communicable diseases—4 weeks ended February 6, 1943.—During the 4 weeks ended February 6, 1943, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	23		Scarlet fever	4	
Leprosy	1		Tetanus	6	6
Malaria	23		Tuberculosis	2	
Measles	4		Typhoid fever	36	4
Paratyphoid fever	1				

Provinces—Notifiable diseases—4 weeks ended January 30, 1943—During the 4 weeks ended January 30, 1943, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1	1	5	11	1	11	30
Chickenpox		2			2	31	35
Diphtheria	1	24	7	1	1	2	36
Hookworm disease		5					5
Leprosy	1	1		2			4
Malaria	72	25	5	33	7	610	752
Measles		5				5	10
Poliomyelitis	1	1		1	2	3	8
Scarlet fever	1	3					4
Tuberculosis	14	34	12	41	7	42	150
Typhoid fever	9	49	7	31	7	16	119
Whooping cough				1		14	15
Yaws						1	1

[1] Includes the city of Habana.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

(Few reports are available from the invaded countries of Europe and other nations in war zones.)

Plague

Argentina—Cordoba Province.—During the months of October, November, and December, 1942, 3 cases of plague with 2 deaths were reported in Cordoba Province, Argentina.

Peru.—During the month of December 1942, plague was reported in Peru, by Departments, as follows: Ancash, 2 cases, 1 death; Libertad, 2 cases, 2 deaths; Lima, Lima City, 1 case and murine infection.

Smallpox

Argentina—Salta Province.—During the month of December 1942, 95 cases of smallpox with 33 deaths were reported in Salta Province, Argentina.

Spain.—During the week ended January 23, 1943, 9 cases of smallpox were reported in Spain.

Turkey—Istanbul.—During the month of December 1942, 122 cases of smallpox were reported in Istanbul, Turkey.

Union of South Africa.—For the months of September, October, and November, 1942, 362 cases of smallpox were reported in the Union of South Africa.

Typhus Fever

Germany.—For the months of October, November, and December, 1942, 643 cases of typhus fever were reported in Germany.

Hungary.—For the 2 weeks ended February 6, 1943, 21 cases of typhus fever were reported in Hungary.

Mexico—Mexico, D. F.—Information dated February 4, 1943, states that for the month of December 1942, 104 cases of typhus fever with 18 deaths were reported in Mexico, D. F., Mexico, and for the period January 1–23, 1943, 91 cases of typhus fever were reported. The disease is said to be confined principally to the poorer classes.

Morocco—Casablanca.—Typhus fever has been reported in Casablanca, Morocco, as follows: Week ended January 2, 1943, 8 cases; week ended January 9, 6 cases.

Rumania.—For the week ended January 23, 1943, 225 cases of typhus fever were reported in Rumania.

Slovakia.—Typhus fever has been reported in Slovakia as follows: Week ended January 16, 1943, 12 cases; week ended January 23, 1943, 3 cases.

Spain.—During the week ended January 23, 1943, 56 cases of typhus fever were reported in Spain, including 4 cases in Madrid.

Union of South Africa.—During the months of September, October, and November, 1942, 912 cases of typhus fever were reported in the Union of South Africa.

Yellow Fever

Colombia—Intendencia of Meta.—On January 12, 1943, 1 death from yellow fever was reported in Intendencia of Meta, Colombia.

Nigeria—Port Harcourt.—The suspected case of yellow fever in Port Harcourt, Nigeria, reported on page 294 of the PUBLIC HEALTH REPORTS of February 12, 1943, has not been confirmed.

MANUAL FOR THE MICROSCOPICAL DIAGNOSIS OF MALARIA [1]

A Review

Quoting from the foreword written by Dr. Marshall A. Barber, "This manual begins with a description of the morphology and life history of the parasites of the different species of malaria, a description which is clear and thorough and should be useful to both the beginner in the subject and to one who may wish a concise review. The author uses throughout the terminology recommended by the Subcommittee of the Health Organization of the League of Nations.

"The manual consists in a treatment of the microscopical diagnosis of malaria in man and describes thoroughly the technique of the thick and thin films, and not only guides to the straight road leading to a correct diagnosis but also points out the various pitfalls awaiting the unwary microscopist."

Of special value are the six color plates from water-color drawings. These show the appearance of the three common species of malaria in the thin film, as well as in the thick film. There are also six plates of microphotographs of malaria parasites and one which illustrates the procedure of making the thick blood film.

[1] National Institute of Health Bulletin No. 180, "Manual for the microscopical diagnosis of malaria," by Assistant Technologist Aimee Wilcox, U. S. Public Health Service. For sale by the Superintendent of Documents, Washington, D. C., price 30 cents.

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